Claims

- A method for determining the optical temporal response of a medium to a short optical pulse excitation, said method comprising the following steps:
 - (a) sending light through said medium, wherein said light comprises spectral frequencies which make up the Fourier transform of said short pulse to be emulated;
 - (b) detecting spectral components of said light exiting said medium;
 - (c) determining the relative amplitude and phase change of each of said spectral components with respect to that of said illuminating light source;
 - (d) obtaining from said relative amplitude and phase change the spectral response of said medium;
 - (e) computationally performing an inverse Fourier transform on said spectral response; and
 - (f) obtaining the temporal response of said medium to said emulated short pulse from said inverse Fourier Transform.
- 2. A method according to claim 1, where the light is a CW.
- 3. A method according to claim 1, where the light is modulated.

- 4. A method according to claim 1, wherein the light comprises substantially all of the spectral frequencies which make up the Fourier transform of the short pulse to be emulated.
- 5. A method according to claim 1, wherein the light comprises substantially less than all of the spectral frequencies which make up the Fourier transform of the short pulse to be emulated.
- 6. A method according to claim 1, wherein the light has a carrier frequency, which is scanned over time; and the relative amplitude and phase change are determined for each carrier frequency.
- 7. A method according to claim 1, wherein the light consists of a broad spectral bandwidth and each of the spectral components of the output of said light exiting the medium are detected.
- 8. A method according to claim 1, wherein the light is detected either at a point, along a line, or over a two-dimensional area.
- 9. A method according to claim 1, wherein the light transmitted through the medium is detected.

- 10. A method according to claim 1, wherein the light reflected back from the medium is detected.
- 11.A method according to claim 1, wherein the light, which exits the medium at any angle with respect to the illumination path, is detected.
- 12.A method according to claims 1, wherein at least one object is embedded within the medium.
- 13.A method according to claim 12, wherein the at least one object is detected.
- 14. A method according to claim 12, wherein the at least one object is imaged.
- 15. A method according to claim 12 where the at least one object comprises a cancerous growth and the medium comprises a segment of the human body.
- 16.A method according to claim 1, wherein the medium comprises discrete layers.

- -26-
- 17.A method according to claim 1, wherein the 'first light' response, which is indicative of the position and shape of said object or objects embedded in an optically turbid medium and/or obstructed by other objects, which are at least partially transparent, is determined from the optical temporal response.
- 18. A method according to claim 1, wherein a specific segment of the temporal response, which is indicative of the position and shape of the object or objects embedded in an optically turbid medium and/or obstructed by other objects, which are at least partially transparent, is determined from said optical temporal response
- 19. A system for determining the optical temporal response of a medium to a short optical pulse excitation, said system comprising the following components:
 - a tunable laser;
 - an RF oscillator;
 - modulating means;
 - detecting means;
 - an optically scattering medium;
 - electronic processing means; and
 - optional optical elements means.